

**INTEGRATED ELECTROSTATIC INDUCTIVE COUPLING
FOR PLASMA PROCESSING**

Abstract of the Disclosure:

An integrated electrostatic inductively-coupled (i-ESIC) device is provided for
5 plasma processing that may be used as a primary or secondary source for generating a
plasma to prepare substrates for, and to process substrates by applying, dielectric and
conductive coatings. The i-ESIC device is practical for processing advanced
semiconductor devices and integrated circuits that require uniform and dense plasma.
The invention may be embodied in an apparatus that contains a substrate support,
10 typically including an electrostatic chuck, that controls ion energy by capacitively
coupling RF power to the plasma and generating voltage bias on the wafer relative to the
plasma potential. An integrated inductive coupling element is provided at the perimeter
of the substrate support that increases plasma density at the perimeter of the wafer,
compensating for the radial loss of charged particles toward chamber walls, to produce
15 uniform plasma density above the processed wafer. An annular slotted shield protects
the inductive coupling element from the plasma and provides conditions for effective
inductive coupling of RF power into the plasma, such as eliminating capacitive coupling
from the element to the plasma and unwanted sputtering of the element. The i-ESIC
device has a capacitive coupling zone in its center where wafers are placed and an
20 inductive coupling zone at the perimeter of the wafer coupled to a matching network and
RF generator. Both zones together with plasma create a resonant circuit.